

INSTALLATION MANUAL

CSD-714 SELCAL DECODER



**CSD-714 SELCAL
INSTALLATION AND
OPERATION MANUAL**

Avtech Part Numbers 1200008-000, -001, -002, & -003

**MANUAL PART NUMBER
0200013-000**

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CHANGE RECORD

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DESCRIPTION

The CSD-714 SELCAL DECODER is a rack mounted, 16 tone decoder for the ICAO and ARINC standard SELCAL system, as defined in RTCA paper DO-93. It is available in both two channel (-001, -003) and five channel (-000, -002) versions. It has independent inputs for up to five radios, depending on version, to drive up to five decoder channels. It is connected to any communication radio receivers (typically the VHF and HF receivers) and monitors their audio outputs for the SELCAL tone codes. Upon receiving the code for which it is programmed it will cause annunciator control line outputs to activate to alert the crew that a call has been received.

TSO'd to TSO C59 and designed to meet or exceed the performance requirements of ARINC Characteristic 714, the CSD-714 uses proven aircraft techniques and materials and is digitally based and crystal controlled using a microprocessor, digital filters and signal processing, and digital frequency generation for its decoding functions. The entire unit is housed in a 1 MCU size case as defined in ARINC characteristic 600 and is made entirely of aluminum which has been anodized and painted for protection and appearance. The materials used within the unit are of the high quality associated with air transport equipment and consideration has been given to the safety and reliability requirements of air transport operations.

By grounding pins in the rear connector of the unit, either at the connector or by using a code selector panel, the individual code assigned to the aircraft is programmed for the unit to recognize.

There are several output lines to control the annunciation of a decoded call. Up to five of the lines are intended to activate lights to indicate which of the inputs received the call, and two of the lines are used to determine whether the lights will be on steady or flash and to strobe a chime in the aircraft audio system.

The decoder channels are individually reset by grounding the RESET input pins on the connector. When all channels have been reset, the steady and interrupted annunciator output lines will be deactivated. The reset lines are fully diode isolated and may be used with the individual radio push-to-talk circuits for automatic reset upon transmission.

A Self-Test function is activated by grounding the SELF-TEST input on the connector and will fully test the unit by generating audio tones internally and coupling them to the inputs of the unit.

OPERATION

Pilot operation of the CSD-714 is limited to resetting it after a call and performing a self-test.

Normal Operation

There are several installation options concerning how the annunciator lamps and audio annunciation work, as well as how the unit is reset after a call. The lamps may be connected to either be on steady or to flash when a call is received, and the audio annunciator may either ring once, ring repeatedly, or not at all. Resetting the unit may be accomplished via a single reset button, one for each channel, or by selecting the associated radio and transmitting on it, causing its push-to-talk circuitry to reset the SELCAL. The pilot should determine from the installation agency what the normal SELCAL response should be to a call and how to reset the annunciators.

In any case, the receipt of a SELCAL call will illuminate only the annunciator lamp for the radio which detected the call.

Manual SELF-TEST Operation

Generating a SELF-TEST is done by pressing the SELF-TEST button, if installed. Pushing and releasing the SELF-TEST button initiates an internal sequence within the CSD-714 which tests the unit completely. A fully functioning unit will complete the self-test within approximately four seconds by indicating a SELCAL call has been detected on all channels at once. Should all channels not test correctly, the annunciator light for the failed channel will not light. Should the unit find that the code selection programmed into the unit is invalid, it will not light any of the annunciators and will appear to have done nothing.

In the -000 and -002 versions the annunciator outputs resulting from a self-test remain active until manually reset. In the -002 and -003 versions the annunciator outputs resulting from a self-test remain active for approximately two seconds and then automatically reset.

Power On SELF-TEST Operation

When power is initially applied to the unit, if the code selection the unit is programmed for is invalid the unit will light all annunciators and will flash and strobe the chime as appropriate and will not respond to RESET input commands. In this case, the pilot should turn the unit off and report it malfunctioning.

SPECIFICATIONS

Model Number:	CSD-714
Avtech Part Numbers:	1200008-000 (5 channel, standard self-test) 1200008-001 (2 channel, standard self-test) 1200008-002 (5 channel, auto-reset self-test) 1200008-003 (2 channel, auto-reset self-test)
Certified to TSO:	C59
Conforms to RTCA Spec:	DO-93 as amended.
RTCA DO-160B Categories:	F2BA/MNO/XXXXXXXXZAAZZZZ
Software Certification:	Software has been tested and documented per the requirements of RTCA paper DO-178A for Level 3 software.
ARINC Characteristics:	Complies with the performance, packaging and environmental requirements of ARINC characteristic 714 and 600.
Number of Channels:	Five (-000, -002) Two (-001, -003)
Size:	1.12" wide, 7.63" high, 12.52" long, defined as 1 MCU by ARINC 600.
Mounting:	Aircraft racking per ARINC Characteristic 600.
Weight:	2.9 pounds
Operating Temperature:	-55 degrees centigrade to +70 degrees centigrade continuous.
DO-160B Vibration:	Categories MNO for non-vibration isolated mounting in Helicopters and Fixed Wing turbojet and propeller driven aircraft.
Operating Altitude:	Up to 55,000 feet, non-pressurized.
Input Voltage:	20 to 35 VDC, 27.5 VDC nominal. Voltage below 18 VDC will inhibit operation of annunciators and decoding.
Input Current:	170 ma nominal, 250 ma maximum

Mating Connector:	ARINC 600 style, size 1 with blank cavity A, Middle insert Arrangement 01 (60 pins), Bottom insert Arrangement 03 (2 coax, 2 size 16 pins, 1 size 12 pin).
Tone Inputs:	Two or five inputs, transformer coupled. Each input is nominally 10,000 ohms input impedance.
Input Tone Level:	0.1 VMS to 3.2 VMS
Tone Frequency Tolerance:	Normal operation with tones less than 0.3% off frequency.
Tone Rejection:	Greater than 36 dB rejection to tones more than +/- 3.5 percent off frequency.
Tone Amplitude Difference: (Twist)	Must be less than 10 dB.
Tone Duration:	750 milliseconds minimum, 1.25 seconds maximum
Tone to Noise Ratio:	-6 dB minimum.
Tones Decoded:	16 ARINC standard SELCAL tones, labeled A, B, C, D, E, F, G, H, J, K, L, M, P, Q, R, S.
Code Selection Method:	Jumper wires in the installation harness or ARINC compatible SELCAL selector panel.
ARINC Interfaces:	NON-INTERRUPT and INTERRUPT lines, turned on per ARINC 714 for chime and external annunciators. Maximum off voltage, 80 VDC. Maximum on current, 2 amps.
Annunciator Interfaces:	Two or five outputs which connect to LIGHTS IN pin when associated channel is decoded. Maximum off voltage, 80 VDC. Maximum on current, 2 amps.
External Resets:	Two or five inputs, normally open. Closure to ground will reset associated channel annunciation.
Self-Test:	Grounding SELF-TEST pin on connector will cause unit to perform complete end-to-end self-test. Unit checks for valid decode code strapping upon self-test.

Power-On Self Test: Unit checks for valid decode code strapping upon power-on and will latch all annunciators on if invalid.

INSTALLATION

The CSD-714 is intended for mounting in the radio equipment bay of an aircraft and due to its wide operating temperature range does not need to be in a temperature controlled environment. Although the CSD-714 is equipped to monitor two or five inputs depending on version, it is not necessary to use all channels.

At installation it is necessary to connect various pins in the units connector to program the sequence necessary for a valid decode. This procedure is detailed in Note 1 for Figure 1 and in Figure 3 of this section.

The installation wiring drawing (Figure 1) shows connection pins for airline VHF communication transceivers which meet either ARINC characteristic 716 or 566. Other transceivers may be used, such as HF units, if the equivalent pins are utilized.

Audio for the CSD-714 input is normally obtained from the SELCAL output of VHF and HF receivers. The audio level at the SELCAL output is normally within the range of the input levels accommodated by the CSD-714 and may be connected directly. If the CSD-714 is to be wired to the squelched audio as might be found at the input to the audio selector panel, the levels are generally greater than the maximum input rating of the CSD-714. In this case, a 10 to 1 voltage divider (20 dB of attenuation) should be used in the audio input to the decoder. Avtech provides a in line attenuator under the part number 1200009-000 or one may be fabricated locally using Figure 4 as a guide. It is to be installed with the output end directly into the CSD-714 mating connector, and the input end spliced into the audio circuit wiring. This attenuator will reduce normal aircraft audio levels to a level compatible with the CSD-714 (100 mw into 600 ohms, equivalent to 7.7 VRMS will be converted to 0.77 VRMS).

The assignment of codes for SELCAL operation is coordinated by SELCAL Registrar, Aeronautical Radio, Inc., 2551 Riva Road, Annapolis, Maryland, 21401. Phone number is (410) 266-4142. Contact them if a code has not been assigned to the aircraft. They will require the following information:

Name of Applicant Company
Person to Contact
Aircraft Registration Number
Company Address
Intended world areas of operation
If your decoder is a 12 or 16 tone decoder.
(The CSD-714 is a 16 tone decoder)

There is no charge for a code assignment at this time. This code is assigned to the USER and does NOT transfer with the aircraft when it is sold.

INSTALLATION TESTING

The following tests should be performed to verify the installation in the airplane is operating properly:

1. Apply power to the unit and press the SELF-TEST button to initiate a SELF-TEST. Within approximately four seconds an indication of a SELCAL decode should be received on all annunciators simultaneously.
2. Using a ground test set such as the Avtech CTS-700 SELCAL/ATSCALL Ramp Test Set, select the frequency for test on one of the communication transceivers to which the CSD-714 is connected. On the test frequency generate a SELCAL encoded signal of the code sequence programmed into the CSD-714. Confirm that the appropriate annunciator lamp illuminates and the chime is heard, if installed. Take the appropriate action to reset the unit. Do this test for all SELCAL channels and for all radios connected to the CDS-714.
3. If possible, contact the agency which will be furnishing SELCAL service to the aircraft and request a test call.

EQUIPMENT AND ACCESSORY PART NUMBERS

Avtech

Part Number	Description
1200008-000	CSD-714 SELCAL (5 channel, standard self-test)
1200008-001	CSD-714 SELCAL (2 channel, standard self-test)
1200008-002	CSD-714 SELCAL (5 channel, auto-reset self-test)
1200008-003	CSD-714 SELCAL (2 channel, auto-reset self-test)
1200009-000	Attenuator,Audio,20 dB
2000008-003	Connector, Rack Mounted W/Pins
1200011-000	Rack, Mounting, 1 MCU
1000005-001	Test Set, CTS-700 SELCAL/ATSCALL Ramp Test System

NOTES FOR INSTALLATION FIGURES

Note 1 - DECODE PROGRAMMING

Programming the CSD-714 to respond to a selective call is done by connecting the code selection pins on the rear connector to the CODE SELECT RETURN pin on the rear connector (Pin MP9B). The SELCAL code is composed of four letters. For instance a code might be FJ-LQ. The order of the letters within a group of two is not critical, however it is customary to place them in alphabetical order. There are four rows of pins on the rear connector which set the code. The rows are 10, 11 13 and 15 and within a row the pins are labeled A,B,C and D. Row 10 programs the first letter of the selcal code, row 11 the second letter, row 13 the third letter and row 15 the last letter. Figure 3 has a table of which of the pins (A, B, C, and D) in a row should be connected to pin MP9B for which code letter. Figure 3 also has an example of which pins are connected for the example code, FJ-LQ.

Note 2 - LIGHTS IN (Pin MP8A) -- See Figure 5

The internal transistors which control the annunciator lights for the individual channels have their emitters connected to this pin. If the annunciator lights are to be on steady upon decode, ground this pin. If it is desired to have the lamps flash, connect this pin to the INTERRUPT OUT (Pin MP4D) and ground the INTERRUPT IN line (Pin MP4C) as shown in Figure 5.

Note 3 - CHANNEL ANNUNCIATOR LINES -- See Figure 5

The output lines which correspond to the channel annunciators are controlled by internal transistors whose collectors are connected to the appropriate pin (Pin MP6D, MP7A, MP7B, MP7C, and MP7D). They are intended to connect to one side of a lamp which has a variable DC voltage on the other side. Because of the connection described in the section on the LIGHTS IN line, the voltage on the channel annunciator lines must be more positive than the LIGHTS IN pin in order for current to flow. These lines can withstand 80 volts in the off condition and will carry 2 amps when on.

Note 4 - EXTERNAL RESETS and SELF TEST

The EXTERNAL RESET input lines (Pins MP1A, MP1B, MP1C, MP1D and MP2A) must be grounded momentarily when it is desired to reset the associated channel after a decode. They are internally diode isolated and will withstand the voltages associated with push-to-talk circuits if it is desired to reset automatically upon selection of the calling radio and transmitting.

If manual reset is desired, they may all be tied together and grounded through a normally open, momentary contact switch. The SELF-TEST input (Pin MP3D) is activated by grounding it momentarily. All of these inputs are considered grounded when the voltage on the pin is less than 3.5 volts and are open when it is above 8 volts. Internally they are connected to 10 VDC through a 4700 ohm resistor and will source approximately 2 milliamps when grounded.

Note 5 - INTERRUPT and NON-INTERRUPT ARINC OUTPUTS -- See Figure 5

The INTERRUPT and NON-INTERRUPT lines have both IN and OUT lines. The IN lines connect to emitters of internal transistors whose collectors are connected to the associated OUT line. When a SELCAL is decoded, the NON-INTERRUPT transistor will turn on and stay on until all channels have been reset. The INTERRUPT transistor will be turned on and off at a 1/2 second on, 1/2 second off rate until all channels have been reset. The IN and OUT lines are diode isolated to prevent damage and sneak circuits and require that the OUT line be more positive in voltage than the IN line for current to flow. Don't blame us for this nomenclature, that's the way ARINC defined it. In most installations, the INTERRUPT lines are used to flash the annunciator lamps by connecting the LIGHTS IN line (Pin MP8A) to the INTERRUPT OUT line (Pin MP4D) and grounding the INTERRUPT IN line (Pin MP4C) as shown in Figure 5. The chime is activated by connecting its control to the NON-INTERRUPT OUT line (Pin MP4B) and grounding the NON-INTERRUPT IN line (Pin MP4A).

Note 6 - AUDIO SOURCE SELECTION

The CSD-714 has two or five decoder channels which are configured to monitor up to two or five inputs, respectively. Each input presents a nominal 10,000 ohm input impedance, and is transformer coupled and isolated from the other inputs.

The CSD-714 MUST be connected to the dedicated SELCAL output of HF receivers if at all possible, since the Clarifier function of the HF affects the frequency of the normal audio output and will cause the SELCAL signals to be off frequency. If the HF does not have a SELCAL output normal audio output may be used, however the HF must then be operated in AM mode whenever a SELCAL signal is expected. It will not receive the call otherwise. If the SELCAL output is not used, verify that the audio level is within the CSD-714 input level rating.

Audio input for the CSD-714 may be obtained from the SELCAL output or the squelched audio output of the VHF communication radios to be monitored. If the SELCAL output is used, it normally is within the input levels specified for the CSD-714 but should be verified by consulting the radio specifications.

If the squelched audio output of the VHF is used, care must be taken to keep the audio input to the CSD-714 within rating. The frequency response of the output must be such that the difference in output level at any two frequencies between 300 and 1500 Hz is less than 3 dB. A 20 dB attenuator may be required to reduce the audio level as referenced at the beginning of this section. Do not use audio from cockpit volume controls as input to the CSD-714.

For receivers without transformer outputs with HI and LO signal lines, return the CSD-714 INPUT LO lines for the appropriate channel to a ground which is physically and electrically close to the source radio to avoid ground noise pickup. Use twisted, shielded wire to connect the audio to avoid hum and noise pickup.

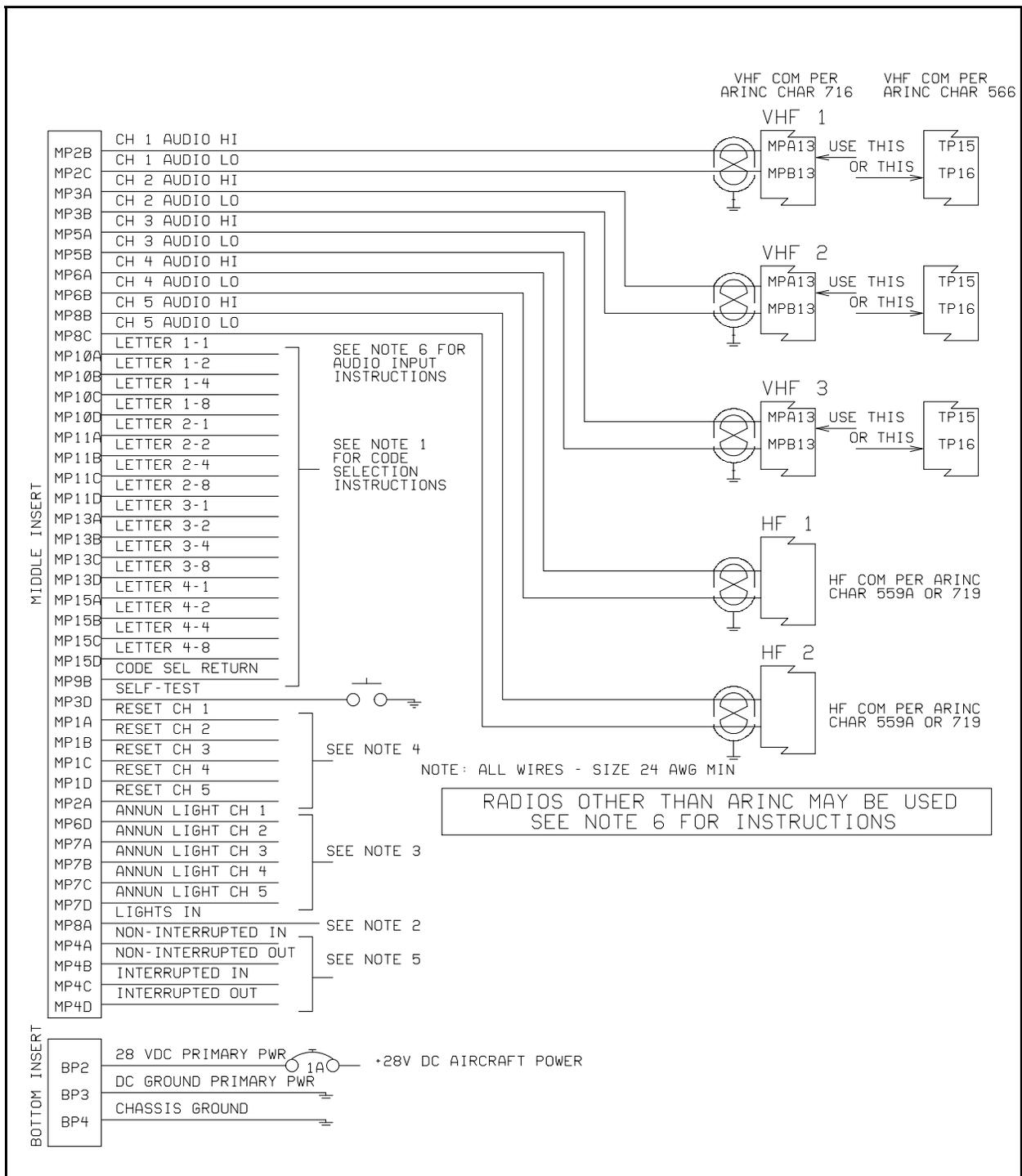


Figure 1 - Wiring Diagram

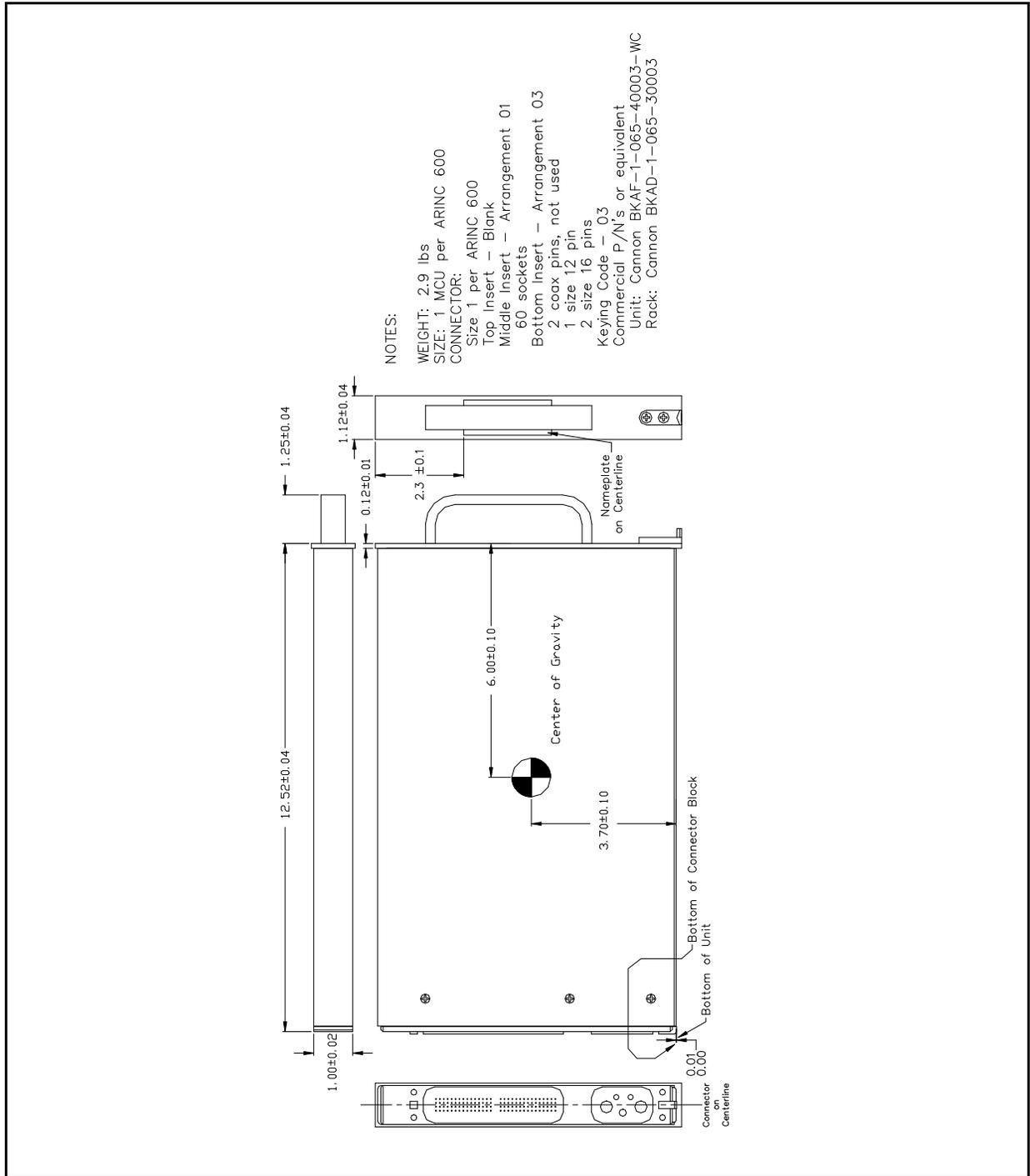


Figure 2 - Outline Drawing

Code Letter	J1 Pin			
Position				
First	MP10D	MP10C	MP10B	MP10A
Second	MP11D	MP11C	MP11B	MP11A
Third	MP13D	MP13C	MP13B	MP13A
Fourth	MP15D	MP15C	MP15B	MP15A

Code Letter	J1 MP10, MP11, MP13, MP15 Pin Coding			
	DCBA		DCBA	
A	0001	J	1001	
B	0010	K	1010	
C	0011	L	1011	
D	0100	M	1100	
E	0101	P	1101	
F	0110	Q	1110	
G	0111	R	1111	
H	1000	S	0000	

0 represents a connection to the CODE SEL RETURN, Pin MP9B, or ground.
 1 represents no connection to this pin.

Example:
 Code FJ-LQ is programmed by jumpering the following pins to pin MP9B:

MP10A & MP10D	(Letter F)
MP11B & MP11C	(Letter J)
MP13C	(Letter L)
MP15A	(Letter Q)

Figure 3 - Code Programming

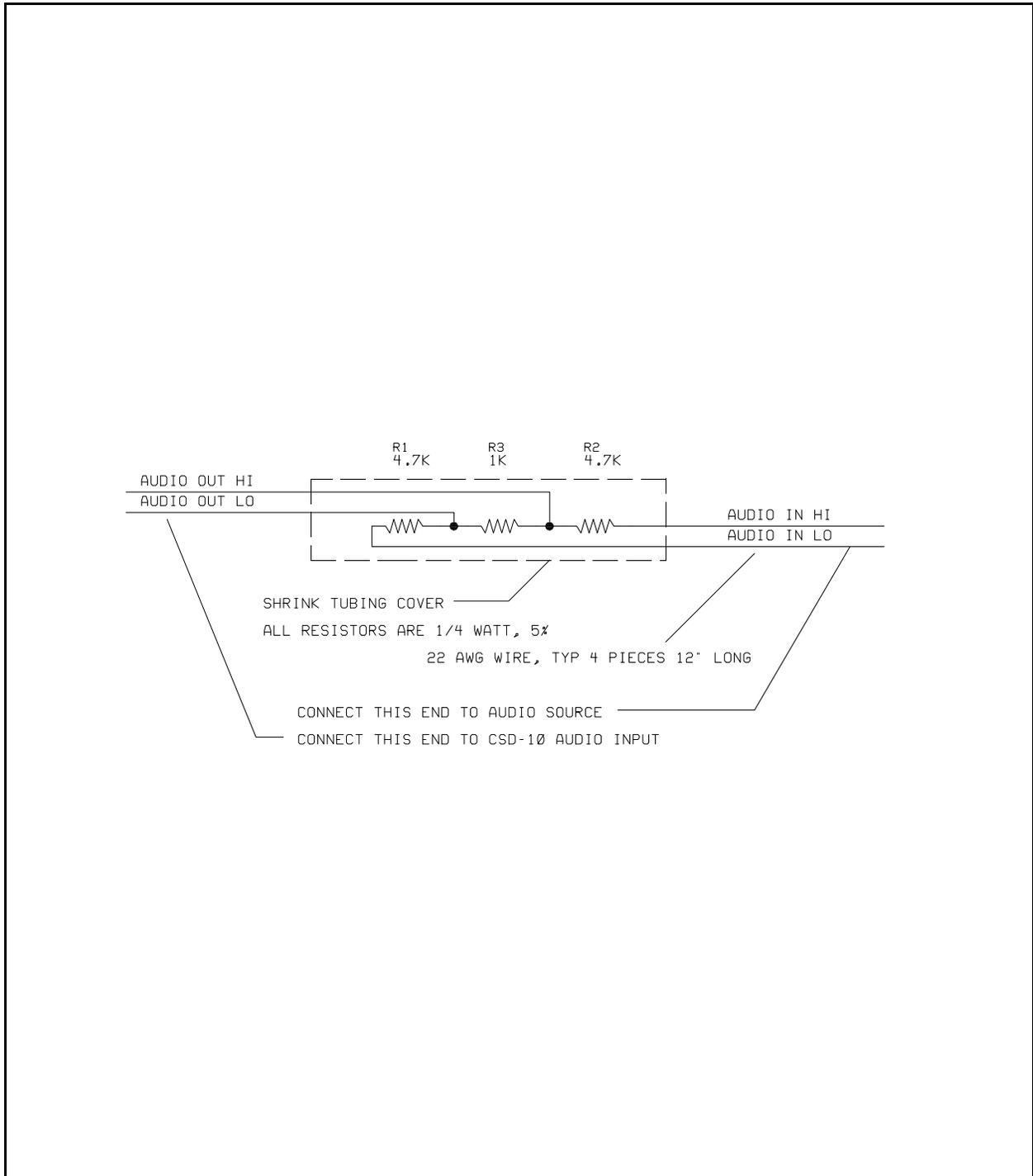


Figure 4 - 20 dB Attenuator

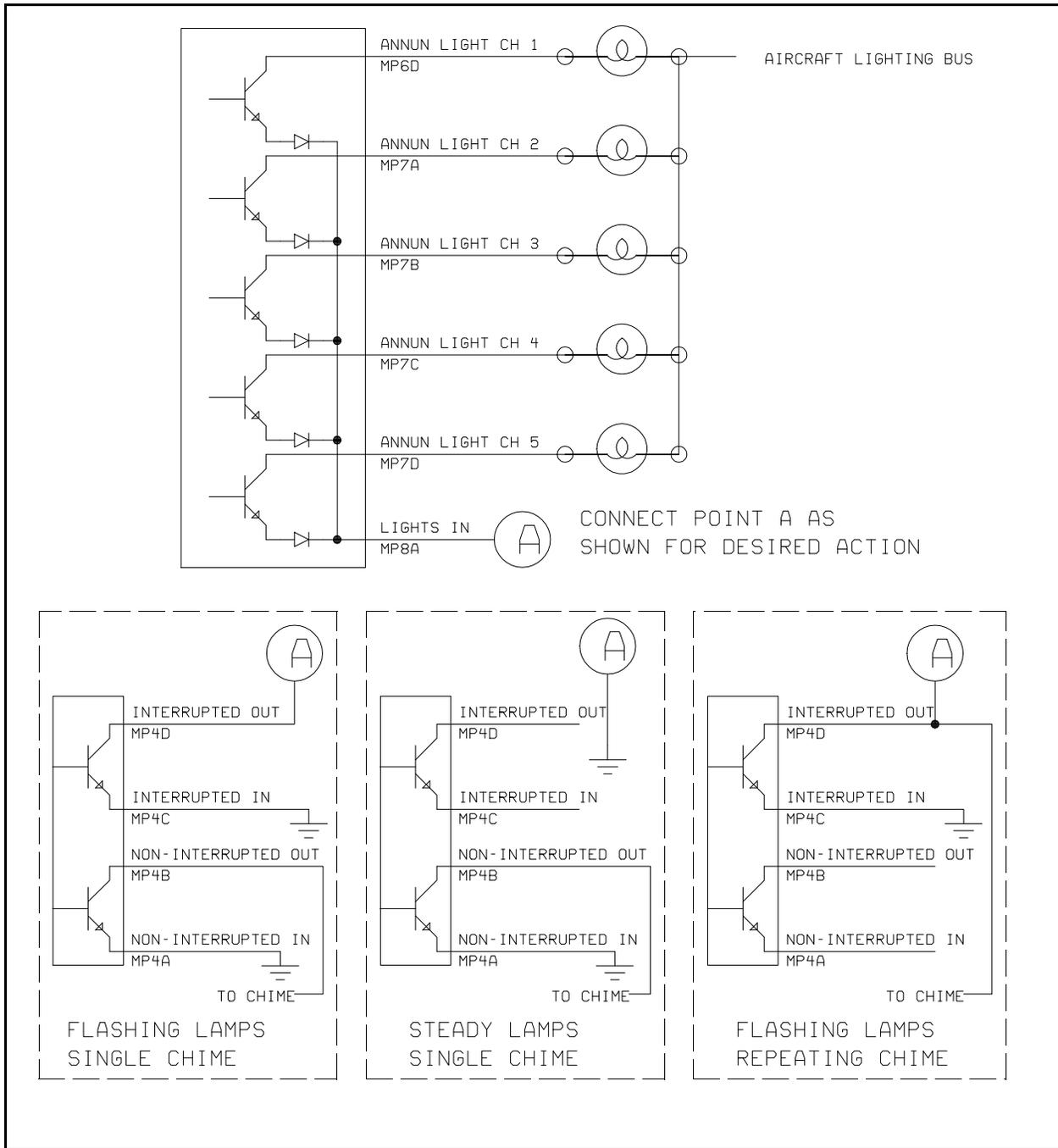


Figure 5 - Annunciator Output Circuits